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ABSTRACT

The personal and cumulative experiential knowledge of the education profession has been valued out of proportion to that which could be contributed by research. A comparison of education with agriculture provides a contrast showing the potential importance of the use of research in teacher education. Educational research is not as well developed as agricultural research; mechanisms for transforming research into usable process and products are not as advanced; and there is insufficient commitment to the importance of research information to ensure funding for research and development activities. Teacher educators should include research information in all three training program components: general studies, the major field or the content that is taught, and the professional education sequence. Eight areas of research important to the teaching profession are: (1) history and philosophy of education; (2) teacher recruitment and selection; (3) effective schools; (4) policy studies; (5) child characteristics and development; (6) instruction, classroom management, learning environment; (7) how children learn; and (8) instruction in specific subject areas. (JD)

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The Role of Research in Teacher Education

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Education did not find itself in March of 1983 under sudden attack from newspapers, news magazines, taxpayers and parents. Instead, there has been a gradually rising flow of criticism that more than once has seemed to have reached high tide and then begun to ebb, only to be pushed forward by some new current. At the same time that critics have attacked education, friends have defended us, and the effect has been mixed. The most recent maelstrom of controversy about education has as its primary origin *A NATION AT RISK*, the report of the Commission on Excellence in Education. Newspapers, news magazines, and many members of the public have picked up on the findings, discussion and recommendations of *A NATION AT RISK* and other reports and concluded the worst about our schools, our school personnel and the institutions that educate them. Often out of pride and frustration and occasionally from ignorance or indolence, we have reacted defensively and sometimes complacently. *These responses are natural, but inadequate.* We must correct misinformation. We cannot stand idly by while ill-informed and occasionally badly motivated critics attack those institutions and people responsible for educating our youth; but we also must show that we know that even the best can improve, and we must show a willingness to do so.

One dimension on which we in education lag behind most other professions is in the conduct of research and the systematic use of information produced by research. (For a much more complete discussion of the potential role of research [inquiry] in education, see Gideonse, 1983.) Because the intent of this paper is to deal with how the interaction between teacher education and research can help improve the performance of our profession, it is organized around three topics: (1) the role of research in education, (2) the

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content and structure of teacher education, and (3) an effort at program improvement in teacher education through the use of research information.

Research and Education

The practice of any profession, whether that profession is engineering, architecture, medicine, agriculture or education, is dependent on information from at least three sources—the experience of the individual professional, the accumulated experience of the profession, and research. Each profession has a different history of how its members put information from these three sources together and each one has a different history of research and development activities. Furthermore, each profession has had a set of obstacles to overcome in order for research to assume an appropriate role as a source of information to assist in professional practice.

Like other professions, education has its own special problems related to the conduct and utilization of research. Two brief incidents, taken together, represent much of what underlies our present problematic circumstance in the conduct and use of research in education. The first incident happened several years ago at a major university in the home state of the chairman of the Senate Appropriations Committee, a senator who was openly derisive of the National Institute of Education and who on more than one occasion recommended zero funding for it. This same senator strongly supported research in other fields. At dinner one evening, I was seated by a university education faculty member who was politically associated with the senator. Thinking that this was an opportunity to help secure support for NIE, I mentioned the senator's opposition and suggested that the faculty member might enlist his support for research in education. Her response was, "Oh, I know that he is opposed to NIE. So am I. NIE doesn't do anything for us. And, besides, research isn't important in education anyway."

The second incident occurred at a meeting in which a junior high school principal spoke harshly about teacher education—much more harshly than appeared either accurate or appropriate. When I remonstrated, he related the following experience. He was invited to speak to a group of teacher education seniors who were ready to begin student teaching. His assignment was to discuss with them research information that he had found useful in his junior high school, but he didn't want to bore them by reviewing research that they already knew so he asked that they signal when he touched on familiar material. He began by discussing Ben Bloom's taxonomy and mastery learning ideas. Two or three hands went up. He continued with Joe Hunt's research on the importance of learning and development during the first few years of life. Still, two or three hands. Then he went on to the Anderson, Evertson, Brophy, and Emmer classroom management research and to the Beginning Teacher Evaluation Study and other research on time to learn. All evidence of prior familiarity disappeared. The junior high school principal's conclusion was that if the research is old enough to appear in the standard textbooks, some of our students may be introduced to it; if the

research is so recent as to be only in the journals or other current publications, almost none of them will even have heard of it.

In order to obtain added insight about one profession, it is sometimes useful to consider it in relation to another profession. To permit achieving the insight that may come from such a comparison, I should like to divert our attention from education to another field, to illustrate how research can change the manner in which the professional in the field functions. The field that I have chosen is agriculture.

Historically, we have not thought of the farmer as a professional. In fact, even in Nebraska where agriculture forms the state's economic base, being called a farmer often is not considered a mark of approbation. But more and more, the farmer is a professional, an agriculturist, a person who must have extensive knowledge that is based on research—in diseases, economics, plant and animal breeding, soils, climatology, and technology—and must use that knowledge in increasingly complex and integrated ways in order to be successful. So let's consider the agricultural professional, the 1980s farmer and along with that farmer, the educational professional, the 1980s teacher, or teacher educator.

In the past, most of us have thought of the farmer as a person who tasted the soil to determine its acidity, employed a diviner to locate the best place to dig a well, held up an index finger to determine the wind's direction, prayed for rain or sunshine, and worked from dawn till dark. This farmer learned his trade from his father, serving a two-decade apprenticeship. What he knew, he learned from that apprenticeship. In 1983, the pattern is different. The successful farmer has attended a first rate, well-funded university. He or she has studied chemistry, physics, biology, history, sociology, and economics, and the applications of those sciences to agriculture. 1980s farmers have personal computers to receive up-to-the-minute weather and market reports and to tell them when to turn their quarter section, pivot irrigation systems on and off, and sometimes to do it for them. These farmers drive massive, complicated tractors and harvesters while sitting in air conditioned, stereo-equipped cabs; they recognize potential disease problems in plants and animals, and they know the chemical properties of the herbicides and fertilizers that they use and the implications of those properties. They know the characteristics of weeds and soils, they know the intricacies and the implications of soil erosion, and they know about nature's aquifers that store their water. The science that these farmers draw upon began in the laboratories and other work places of biochemists, atomic physicists, geneticists, botanists and economists. Knowledge gained in these fields was transformed and tested by applied scientists in agriculture, in their specialized laboratories and experimental herds and field plots. Finally, they were field tested on farms and ranches for feasibility and practicability and the information was made available through a nationwide Cooperative Extension Service. Successful farmers of the 1980s keep current on the implications of field tested developments and they know enough of the underpinning science to be able to interpret more than just the conclusions.

Successful farmers of the 1980s also have served a kind of apprenticeship, both before and after they completed their university education. These farmers synthesize the science of the classroom with the experience gained from day to day, season to season work with corn and cattle, wheat and turkeys, soil and water. To the extent that they successfully synthesize knowledge from these quite different sources, they become successful; the farmer who relies too heavily on knowledge from one source or the other, ultimately will fall short of his or her potential.

Farming has changed dramatically during the past fifty years—even during the past five to ten years. *For example, even though the number of persons employed on Nebraska's farms has decreased more than twenty percent in just the last five years, production has continued to increase.* These counter-trends have resulted from farmers' ability to synthesize the information from their scientific knowledge base with that from their experiential knowledge base and to use and continue to test that knowledge in the real world of farming. No farmer, any more than a teacher, a physician, or an architect, simply applies what he or she reads in an extension service bulletin. The farmer reads, ponders, adapts, applies, evaluates, and modifies—just as any other professional does.

In every realm, not just in agriculture, present day society has been enriched by efforts of scientists and scholars. Space travel, nuclear power, the green revolution, organ transplants, friendly microcomputers, and the elimination of measles, diptheria, and poliomyletus all have come about through research coupled with powerful systems for keeping users appropriately informed. Like other fields, education depends for its progress on developing new knowledge and converting that knowledge to usable materials and processes and then making those materials and processes available to teachers, administrators, other school personnel and to educational policymakers so that they can study them, test them in their own ways and situations as professionals do in other fields and then use them as appropriate. Preschool education, classroom management, the teaching of reading and mathematics, the use of instructional time, and the teaching of handicapped children are examples of education areas in which research has begun to build a sizeable knowledge base during the past few years.

* Federal and state-level policymakers have been sufficiently informed by longitudinal studies that they can be confident that well-planned and conducted preschool programs for at risk children will be both personally and socially beneficial as well as financially sound investments (Weikart & Schweinhart, 1979; Darlington, 1982).

* Through classroom management and time for learning research and development activities, teachers and administrators have been provided information and materials that they can use in improving overall efficiency and effectiveness of classrooms and schools (Denham & Lieberman, 1980; AASA, 1982; Brophy, 1983).

* Extensive research has demonstrated that direct instruction techniques are highly successful for increasing the early grades achievement of children from

low-income families (Stebbins, St. Pierre, Proper, Anderson & Cerva; Bereiter & Kurland, 1978; Rosenshine, 1983).

Until the middle 1970s almost all of the available evidence suggested that when at risk children experienced good preschool programs, they made immediate gains in IQ that placed them somewhat higher than similar children who did not attend preschool but that when they and similar children entered school the IQ differences disappeared. Furthermore, the large-scale Westinghouse study of Headstart graduates was interpreted as demonstrating that Headstart had no lasting educational benefits. Most of these early studies focused on IQ and standardized achievement test scores. However, when long-term follow-up studies were conducted of at risk children from high quality preschool programs of the 1960s, some of the researchers considered multiple behavioral and social outcomes. On the behavioral and social indices, substantial and significant differences have been found on measures ranging all the way from retention at grade level and assignment to special education classes to delinquency and employment status. This research is of great importance both to early childhood educators and to educational policymakers charged with responsibility for making funding and program decisions (Schweinhart, 1983).

A second example is taken from the "time to learn" research. Simple observation suggests that the more time students (children) spend studying a particular process or content, the more they will learn about it. However, until the last few years, neither researchers nor practitioners paid much attention to this obvious fact. It's true that both states and districts often mandated the amounts of time that should be devoted to specific subject matter areas, but they did little more than mandate. Seldom did anyone seriously follow up to see what happened in actual practice. Twenty years ago, a few educational psychologists began thinking about the issue, but no one set about studying it in detail. Finally, in the middle and late 1970s, the amount of time that was actually spent in teaching and studying began to be researched. Information was produced which suggested that a large portion of school time is not allocated for instruction, that much of the time allocated to instruction is used for non-instructional purposes, and that teachers and administrators can make choices that will increase the amount of time available for student learning (Egbert & Kluender, this volume). This research has immediate and important implications for both teacher education and classroom teaching.

Education also has undergone dramatic changes during the past twenty years. Some of the changes have resulted from court decisions, some from legislation, some from the application of different perspectives, some from a talented sales person creating a novel idea and selling it from coast to coast—and some changes in education have come from research. But the changes that research has wrought in education are not nearly as profound or far reaching as either, (a) the changes produced by research in other fields, or (b) the changes produced in education by other forces.

Although the research base has increased in each of the areas cited, the

application of that research has been sporadic at best. The relative immaturity of the sciences upon which we in education have depended most heavily—psychology and sociology—has contributed to the minimal impact of research on our field. Our failure to perform the systematic translations and transformations that must be done from basic science to applied science to field tested products and processes also has diminished that impact. But even where the applied research has been conducted and the practical implications are fairly obvious, we have failed to take advantage of them. For instance, Biles, Billups and Veitch (1983) note in a report of an American Federation of Teachers project to utilize educational research,

> "None of the TRLs (Teacher Research Linkers) trained in the program were familiar with the bodies of research presented. Few used research information as a continuing frame of reference for daily teaching. Most were skeptical of research, stating that it was conflicting, limited and too difficult to wade through.
>
> By the end of the pilot project, TRLs and teachers they reached reversed those attitudes and began asking 'Is there research on . . .?' TRLs commented in feedback sessions that before the project they never would have looked to research for assistance and that knowing what made for more effective teaching made them think about their own teaching.
>
> All of the TRLs and most of the teachers they reached indicated a certain renewal of professional pride as a result of the program training activities." (pp. 7-8)

I am convinced that the attitudes represented by the pre-training comments from the AFT group are almost universal among teachers and administrators and among teacher educators. At best, we are skeptical of research processes and information; at worst, we are anti-intellectual.

From what I know of research and research use in agriculture and education, my interpretation is that we suffer by comparison, at each step. The science on which we have relied is not as mature as the science undergirding agriculture; we have not developed as complete a system for the step by step integration and transformation of basic research information to usable applications; we have not taught our preservice students the most recent and applicable research information and how to use it; we have not provided inservice and continuing education that draws substantially on a research base; we have not united to secure the necessary funds for educational research, development and dissemination; and we have failed as a profession to understand and appreciate the importance of research to our field. *We have valued the personal and cumulative experiential knowledge of our profession all out of proportion to that which could be contributed by research*, either research which confirms and illuminates good practice (Smith, 1983) or research that opens the way to improvement in practice beyond the best that we know today.

Research and Teacher Education

Research and teacher education have several interactive functions, including the conduct of research by teacher educators. However, the focus of this monograph is the utilization, not the production, of research information in teacher education. To facilitate discussion of the use of research information in teacher education programs, those programs are first described and then the use of research information in them is discussed.

The Content of Teacher Education

Each teacher education program is made up of three major components—general studies, the major field or the content that is taught, and the professional education sequence. The general studies portion of the program usually is very similar, sometimes identical, to that for any other major field in the college or university. That is, teacher education students tend to enroll in the same art, composition and literature courses and the same social and natural science courses as students in English or chemistry or philosophy. For prospective secondary school teachers, the major field also tends to be quite similar to that for students studying the same major but not planning to teach. For prospective elementary teachers, the major field is somewhat more complex. Because most elementary teachers serve in self-contained classrooms and teach everything from reading and mathematics to social studies and science, they complete both some specific content courses such as mathematics, children's literature, and art and a series of methods courses that are, in fact, a combination of curriculum analysis, content for teaching, and teaching methods. In many instances, the major field for elementary teachers is elementary education; in other instances, it may be a separate, subject matter field.

The third portion of the prospective teacher's program, professional education, is, in turn, made up of three parts: undergirding foundations and science courses, curriculum and methods, and field experiences. This portion of the program, which many of our critics view as being the entire program, usually is about 20 percent of a secondary and from 40 to 45 percent of an elementary program.

The foundations and educational science part of the professional program most frequently has three or four courses: introduction to education, human (child or adolescent) development, educational psychology and perhaps one other course—evaluation, philosophy, educational sociology, etc. The field experience usually consists of one semester of full or part time student teaching and one or more pre-student teaching field experiences, plus some field experience in one or more methods or educational science courses. Often, an integrative seminar accompanies student teaching. In secondary education, one or two courses usually comprise the methods part of the professional program; the typical pattern is a special methods course and an additional general methods or curriculum course. In addition, many pro-

grams require a reading methods and/or special education course. In elementary education, the most common core of methods courses is reading, mathematics, science, social studies, language arts, art, music, physical education and special education. The average total credits for the three professional education parts of the elementary and secondary programs in a national sample are shown in Table 1 (Kluender and Egbert, 1983).

Table 1

Average Number of Credits for Elementary and Secondary Teacher Education Programs

Program	*Foundations and Education-Related Science*	*Methods*	*Field Experiences*
Elementary	13.2	30.7	11.3
Secondary	8.6	7.8	10.4

The Application of Research in Teacher Education

Teacher educators should include research information in each of the three general components mentioned earlier—(1) foundations and education-related science, (2) curriculum and methods, and (3) field experiences. For a teacher education program to accommodate extensive new research information, the research must be introduced consistently across the student's multiple experiences. Thus, research information from the foundations and from education-related science should be introduced in the first block of professional courses, its application should be demonstrated and discussed in the curriculum and methods sequence, and it should be applied by the student, with support from the cooperating teacher, in the field experience. Research that documents and explicates the validity of clinical experience (Smith, 1983) as well as research related to the design of new methods and materials may be introduced initially in the curriculum and methods courses, but it also should be applied by the student in field experiences. If this process is followed in sequential steps, there is increased probability that the student not only will learn about the research and be able to apply it but s/he also will have greater appreciation for the value of research to teaching. However, for the sequential experience to occur, teacher educators and cooperating teachers alike must both understand and appreciate the research and must themselves use it in their teaching. Thus, plans for the improvement of teacher education through the utilization of research information must begin with teacher educators and these plans must be comprehensive in their application.

In initial attempts at increased utilization of research information, teacher educators may need to concentrate on a limited and defined portion of the total applicable body of educational research. That is the approach used in this monograph. Figure 1 is a highly simplified separation of the structure of educational research into eight categories in order to facilitate comparison of the portion of educational research reviewed in this document with the total body of such research.

Figure 1 is not intended to be inclusive. In fact, the informality of the sketch is designed to show that it does not attempt to include all of educational research. Furthermore, the separations are recognized as being artificial. They are shown for explanatory purposes.

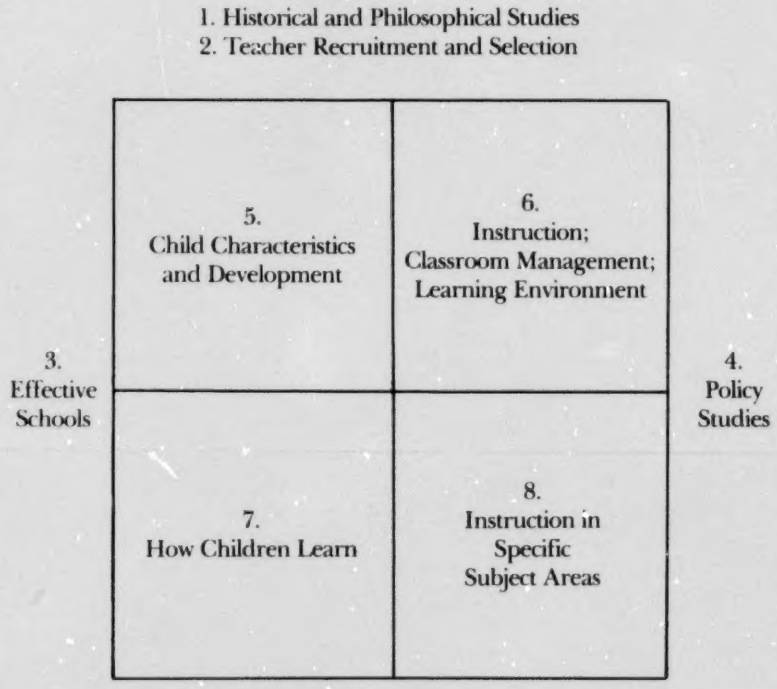
1. Historical and Philosophical Studies
2. Teacher Recruitment and Selection
5. Child Characteristics and Development
6. Instruction; Classroom Management; Learning Environment
3. Effective Schools
4. Policy Studies
7. How Children Learn
8. Instruction in Specific Subject Areas

Figure 1. An Eight-Category Structure of Educational Research

Each of the eight sections shown in Figure 1 represents research that is important to education. Some of the sections are more important to prospective teachers; some are more important to educational policy makers; and still others are more pertinent to school administrators.

Historical and philosophical studies are listed first in the sketch because of the overall perspective they provide. The research on teacher recruitment, selection and retention is listed next because unless we succeed in attracting and keeping excellent teachers, all of our talk about excellence in education will go for naught.

School leadership, organization, and climate, as described in the effective schools research (3) have a powerful influence on the way the classroom

functions, but they are largely external to the individual classroom, as are the equally influential policies (4) set by legislatures, governors, school boards, and state and federal departments of education.

The box in the middle represents the classroom. It is here that most of what is important in schools takes place. Because the focus of teacher education programs is the teacher in the classroom, the papers in this monograph concentrate on that part of the structure. This is not to deny the importance of the other parts of the diagram; it is simply to recognize the centrality of the teacher—both to schools and to teacher educators.

Within the classroom portion of the diagram, this monograph draws from Section 6 (instruction, classroom management and learning environment), and, to a lesser extent, from Section 5 (child characteristics and development). This is done because the research base is reasonably well developed in these two sections and the research is pertinent to all teachers. For some teacher educators, e.g., reading instructors, a portion of the research in Section 8 (instruction in specific subject areas) would be at least as appropriate as that in Sections 5 and 6, and educational psychologists draw much of the content that they teach from Section 7 (how children learn). (For a more complete description of Sections 6 and 8, see Koehler, 1983.) Information developed through research conducted in Section 6 may be most directly useful to classroom teachers. (See papers by Billups, Stallings, Walter, Vasa, Bruning and Egbert and Kluender, this volume.) Staff members at the Research and Development Center for Teacher Education have used research from Section 6 in the preparation of "how to do it" manuals for elementary (Evertson, et.al, 1984) and secondary (Emmer, et.al., 1984) teachers. Information developed through research conducted in Sections 5 and 7 is more likely to illuminate classroom instruction and management research or to have long-term implications for further research than it is to have immediate utility. (See Santmire and Friesen, this volume.)

Other papers in this monograph consider in some detail six bodies of research. Five of the papers fall rather naturally into Section 6 of the diagram; the remaining paper integrates content from Section 5 and Section 6. It is important to note that the six papers do not represent separate entities; they are all part of what takes place in a classroom and what potential teachers need to know and be able to work with. The content from these papers must be viewed in relation to each other, and that content must be synthesized in teacher education programs.

Discussion

This paper has sketched some ideas about the potential importance of research in education. To provide contrast, education was compared with agriculture. Our research is not as well developed; our mechanisms for transforming research into usable processes and products are not nearly as advanced; and we do not have sufficient commitment to the importance of research information to ensure funding for research and development activ-

ities. If leaders in agriculture had been as cavalier in their attitude toward research as we sometimes have been, there would have been no green revolution, there would have been no hybrid corn, and there would have been no dairy surplus. Instead, like the rest of the world, we too would have been living on the margin of our food supply.

This paper also has emphasized the role of teacher education in helping all of education achieve the potential that research holds. As teacher educators, our role is central. We prepare each succeeding generation of teachers, and we provide much of their continuing education.

At this time, several caveats—reservations about this whole task—appear appropriate.

1. There are no drug store pills or fertilizer fixes in education. Maybe someday educational research will turn up something as "clean" as Salk vaccine, but I doubt that *we* will ever see that. In the meantime, we need to use the very best information that we have available from experience and research.
2. Most of the research that educators, or any other professionals, conduct does not produce immediately useful products or processes. In fact, one of the problems with educational research has been that we have not been willing or able to go through the transformation and synthesis essential for making the research useful for practitioners. It is as if the medical profession expected medical doctors to read the chemistry and pharmacology journals and then manufacture their own antibiotics. This is one of the steps that teacher educators must take. We must make appropriate transformations and syntheses of research. This was the initial function of the regional laboratories—to transform research into useful materials and processes and then to disseminate them. Although some of the laboratories have strayed from that mission, others have stayed with it. (See Sikorsky and Ewy, this volume.)
3. The work of changing teacher education programs is not easy. Making substantial changes will require a great deal of both personal and institutional commitment. Work, a willingness to change, a willingness to work together, a willingness to fail and then try again all will be necessary.

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